Thermal Management Of High Power Transformer In Different Outdoor Environment Conditions

Sheltami, K. Refai-Ahmed, G. Shwehdi, M.H.; Dept. of Mech. Eng., King Fahd Univ. of Pet. & Miner., Dhahran, Saudi Arabia;

Thermal and Thermomechanical Phenomena in Electronic Systems, 2004. ITHERM '04. The Ninth Intersociety conference;Publication Date: 1-4 June 2004;ISBN: 0-7803-8357-5

King Fahd University of Petroleum & Minerals

http://www.kfupm.edu.sa

Summary

Power transformers play a vital role across the electrical grid network. This element of the grid network is commonly located in the outdoor environment. Unfortunately, there is no well defined environmental condition to be used as a design guide line. Therefore, this leads to a lack of defining the solar load effect, the worst maximum and minimum ambient temperature, the climbing ambient temperature variation per hour, the Pico and micro climate effects, the maximum altitude, the worst maximum and minimum relative humidity and the dew point temperature. In the present study, the thermal design of a single phase transformer is examined numerically. The environmental condition was selected based on 3 different cities in the northern hemisphere. These cities are Riyadh, Saudi Arabia, Colorado spring, USA and Ottawa, Canada. These cities represent the different environmental conditions which the power transformer can be subjected to it. The current investigation will determine the temperature variation across the windings, insulators and the core. These temperature variations can be eventually used to determine the potential thermal stresses which can lead to the major failure of the transformer. Finally, the authors will propose an environmental condition, which can be used in this type of product, which, in turns, can be used as a starting point for the thermal community to develop a special standard for outdoor high powered equipment.